**Before the**
**Federal Communications Commission**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
| | ) | |
| Amendment of Part 90 of the Commission's Rules to Permit Terrestrial Trunked Radio (TETRA) Technology | ) | WT Docket No. 11-69 |
| | ) | |
| Request by the TETRA Association for Waiver of Sections 90.209, 90.210 and 2.1043 of the Commission's Rules | ) | ET Docket No. 09-234 |
| | ) | |

**COMMENTS OF CASSIDIAN COMMUNICATIONS, INC.,**
**AN EADS NORTH AMERICA COMPANY**
**TO THE NOTICE OF PROPOSED RULE MAKING AND ORDER**

# INTRODUCTION

Cassidian Communications, Inc., an EADS North America Company, ("Cassidian") submits the following comments in response to the Notice of Proposed Rulemaking and Order ("Notice") in the above captioned proceeding. Cassidian fully supports the Federal Communications Commission's ("Commission") efforts to modify the Part 90 rules necessary to allow TETRA and other spectrally efficient technologies operate in narrow band channel environments. Cassidian provides comments supporting the FCC's proposals for occupied bandwidth limit and emission masks to accommodate TETRA.

The only mission critical communication vendor to provide single-site, multi-site, and simulcast communications systems based on the all three open system standards, P25, TETRA and TETRAPOL, Cassidian is a leading provider of "full-circle" security and communications solutions. The Cassidian comprehensive portfolio of proven solutions includes: TIA-102/Project 25, TETRA, TETRAPOL digital land mobile radio; next-generation NG9-1-1 call processing, computer-aided dispatch (CAD), incident mapping, data management

applications; "reverse 911" notification solutions; as well as training, technical support, and a full suite of managed services and professional services.

In 2008, PlantCML® was acquired by EADS North America, a leading supplier of solutions for defense and homeland security, commercial aviation, helicopters, telecommunications and services, and subsequently integrated with EADS Secure Networks land mobile radio operation. The combined organization, now branded as Cassidian Communications, is part of the overall EADS North America operation, which includes companies and divisions located in 32 cities and 17 states, and contributes more than $11 billion to the U.S. economy annually, supporting 200,000 American jobs.

Cassidian has significant practical experience in all aspects of mission critical communications, having designed and deployed more than 200 digital land mobile radio networks in over 68 countries, including 45 of the most sophisticated and technologically-complex nationwide land mobile radio networks in the world. In addition, Cassidian 9-1-1 call center and notification solutions serve over 200 million U.S. residents throughout North America.

## OVERVIEW

Cassidian supports the Commission's efforts to modify the Part 90 rules necessary to allow TETRA and other spectrally efficient technologies to operate in the current VHF and UHF narrow band channel environments. Cassidian provides comments supporting the FCC's proposed rules for occupied bandwidth limit and emission masks to accommodate TETRA.

## TABLE OF CONTENTS

# I. COMMENTS OF CASSIDIAN COMMUNICATIONS, INC.

## A. Interference Potential of TETRA (§III, ¶9)

The Commission makes several statements in the Notice, referring to unsubstantiated interference comments, the TETRA Association's utilization of the TIA TSB-88.1-C[1] ("TSB-88") analysis, the TETRA Association's demonstration of TETRA emissions being "more stringent than the emission mask requirements of Section 90.210 for emissions into the adjacent bands," and then asks for comment on these issues.

Cassidian responds the degree of interference potential is due to two components; (1) the amount of power created on adjacent channels by the transmitting device (in this case TETRA) and (2) the effect of the filtering in the victim receiver. In the TETRA system the ACPR is measured using the appropriate TETRA filter on the victim receiver side. The TETRA system unto itself has quite high ACPR values measured in this way. When analyzing interference potential of TETRA to other adjacent technologies, one needs to calculate the potential utilizing the appropriate victim system's receive filter. Cassidian notes this methodology has been used in Attachment A of the TETRA Association Waiver Request[2] and is in line with the TSB-88 document published by TIA and which provides data on the interference generated by several modulations as measured through various types of receive filters of various bandwidths. Careful inspection of TIA's TSB-88 documentation shows that a conclusion similar to the conclusion of TETRA Association may be drawn from the published data, i.e. that the interferences generated by a TETRA channel into various receive filters in the range of useful bandwidths are notably lower than those generated by most of the currently Commission

[1] Telecommunications Industry Association (TIA), TSB-88.1-C, WIRELESS COMMUNICATIONS SYSTEMS PERFORMANCE IN NOISE AND INTERFERENCE LIMITED SITUATIONS, Part1: Recommended Methods for Technology Independent Performance Modeling, February 2008.

[2] ET Docket 09-234, TETRA Association, "Request for Waiver of Sections 90.209, 90.210, and 2.104", filed November 20, 2009.

authorized equipment, with one notable exception of the +/-5 kHz[3] deviation FM waveform which will eventually be obsoleted in the VHF and UHF bands in the Commission's narrowbanding process[4]. Thus the TETRA Association clearly shows that the interference potential of the TETRA system to existing and deployed systems in the LMR bands is the same order of magnitude or in many cases less than existing intersystem interference. Cassidian agrees with the Commission's conclusion that "TETRA technology provides sufficient interference protection to other technologies."

Cassidian believes that the waiver has the potential for giving US customers access to very cost efficient solutions based on the standardized and interoperable TETRA technology from the global competitive markets. It is imperative for the decision process to avoid rulings that would imply the additional cost of either proprietary non-interoperable modifications of the standard and the resulting vendor lock-in and its negative effect on the level of competition in the market or the cost of the delay stemming from the protracted standardization effort needed for the creation of a local variant of the standard.

### B. Authorized Bandwidth of TETRA (§III, ¶10)

The Commission makes several statements in the Notice concerning authorized bandwidth as noted in Section 90.209(b)(5), commenting that Section 90.209(b)(5) currently limits the authorized bandwidth for 25 kHz channels to 20 kHz and notes that TETRA requires 22 kHz, notes that TETRA ACP limits and OOBE prevent adjacent channel interference in violation of the Commission's rules. Therefore the Commission proposes to amend 90.209(b)(5) to allow the 22 kHz authorized BW if the ACP is met and seeks comment on this rule change.

[3] *Id*. At 1, sections A.6.3.4 and A.6.16.4.

[4] WT Docket 99-87

Cassidian responds that the filtering of the TETRA carrier as presented by PowerTrunk[5] using a modulation filter rolloff factor (alpha factor) of 0.35 (standard value) provides an occupied bandwidth of about 22 kHz. By changing the alpha factor to 0.2, the masks B, C, and G in 90.210 are fulfilled and the bandwidth is roughly 2 kHz less (20 kHz). However, the smaller emission bandwidth has only a minor effect on the ACPR value and the modification is therefore not necessary. Measurements carried out by Cassidian with an external generator in the TETRA mode and with a TETRA receive filter indicate a change of 2.5 dB in the ACPR from approximately -70 dB (alpha = 0.35) to -72.5 dB (alpha = 0.2), while changing the emission bandwidth from approximately 22 kHz to 20 kHz. The bandwidth of 22 kHz still guarantees a sufficiently high ACPR value to protect adjacent systems. Cassidian agrees that use of ACPR is an appropriate measure for adjacent channel interference and that similar analysis is valid for new and existing systems occupying the channel[6].

Finally, the Commission asks if approval of such devices meeting the proposed authorized bandwidth rules will affect PS interoperability. Cassidian responds that deployment of technologies employing different emission spectra will not affect PS interoperability as long as the proposed ACP, OOBE, and appropriate intersystem interference coordination criteria are met.

### C. Emission Masks (§III, ¶11)

The Commission states that "TETRA emissions slightly exceed Emission Masks B, C, & G (sec 90.210)" and notes the TETRA Association comments that although TETRA

[5] ET Docket 09-234, PowerTrunk, "Notice of Ex Parte Presentation", filed June 16, 2010.

[6] In the Waiver the Commission also seeks comment on allowance for other technologies, i.e. allowing any digital technology that needs the full 25 kHz channel yet meets the proposed ACP limits. Cassidian supports the Commission's decision to facilitate the deployment of modern spectrally efficient technologies while protecting the interests of adjacent channel users.

exceeds the masks by 5 dB at a 10 kHz offset from the channel center frequency ($f_c$), "TETRA emissions are at or below" the Part 90 masks and that TETRA emission profiles are "more stringent than the Part 90 limits for emissions in the adjacent channel." The Commission agrees with the TETRA Association and notes the TSB-88 analysis as further supporting these statements. The Commission further notes that TETRA is actually better than emissions just meeting the FCC masks.

Thus the Commission proposes "as an alternative to the emission limits of Section 90.210," to "permit equipment (including TETRA devices) to comply with the ACP limits in the TETRA standard for emissions close to the carrier, or up to seventy-five kilohertz offset from the carrier. At offset frequencies greater than seventy-five kilohertz, the Commission proposes that the emission limits default to the standard limit for Part 90 devices, 43 + 10log (P)."

Cassidian responds similarly if TETRA devices slightly exceed the emission masks B, C and G in 90.210 it does not mean that this will create interference on adjacent channels to other existing systems. The excursion is clearly within the channels own bandwidth of 25 kHz and the excursion itself is of limited bandwidth and also limited amplitude. Cassidian agrees the most appropriate method to evaluate the interference risk is to use an intersystem ACPR (adjacent channel power ratio, as employed in the TETRA Association's Request for Waiver[7]) analysis between the TETRA system emission on the transmit side and the reception filter of the target system on the receive side.

Cassidian's review of attachment A of the original TETRA Association Waiver Request from November 2009 affirms that it has clearly been shown that the excursions of the 90.210 masks are not harmful for existing and already deployed LMR systems. In conclusion

[7] *Id*. At 2.

Cassidian agrees with the Commission's proposed changes to the proposed emission limits of Section 90.210.

### D. Other Issues

#### 1. Cellular Type Architecture and Near-Far Interference Concerns (§III, ¶12)

The Commission notes concerns previously expressed about TETRA "cellular-type" architecture and the resulting near-far interference to incumbent "high-site" systems such as public safety systems. The Commission relates the TETRA Association statement that TETRA cell sizes are large enough that the potential for near-far interference is reduced and asks if any restrictions should be placed on low-elevation cellular-type TETRA deployments. Specifically the Commission requests comment on whether the Commission should adopt for TETRA the same definition of "high density cellular system" applicable to Enhanced Specialized Mobile Radio (ESMR) in Section 90.7 of the Commission's Rules.

Cassidian reviewed Section 90.7 of the Commission's rules and states typical commercial cellular networks are "densely" deployed for achieving high capacity to accommodate the traffic from large number of commercial users (large percentage of population) distributed in the service area. This leads to the deployment of small cells which is achieved by down-tilting the antennas and mounting them at low elevation (e.g., at or below rooftop levels). High capacity networks can then be classified as high density cellular systems, typically meeting the criteria of the definition of High Density Cellular System in Section 90.7

TETRA networks when deployed to provide voice and connectivity service to a much smaller number of professional users, who are a small percentage of the population, are deployed with emphasis on wide-area coverage and leading to large cells and consequently antennas deployed at similar heights as current analog LMR, other digital LMR, and P25 to

achieve the desired coverage with a minimum number of sites. The deployment of TETRA by either building new sites or reuse of existing sites for similar purpose in the proposed bands is no different than deployment of other Commission currently certified applicable narrowband technology (e.g. Opensky). Therefore TETRA networks in the service as proposed by the Commission in this proceeding cannot be classified as high density cellular systems and do not meet the definition of High Density Cellular System in Section 90.7 of the Commission's rules.

**2. Use in the Public Safety Pool (§III, ¶14)**

The Commission particularly seeks comment on whether use of TETRA technology should be permitted on Public Safety Pool frequencies, noting that many 800 MHz Public Safety Pool licensees are adopting Phase I Project 25 technology, which operates with Frequency Division Multiple Access, and therefore is incompatible with TETRA, which uses TDMA. The Commission requests commenters to address how the deployment of TETRA technology in the Public Safety Pool would generally affect interoperability, and whether, if public safety use is authorized, TETRA radios should be required to operate with conventional FM on the NPSPAC mutual aid channels.

Cassidian responds that any public safety radio operating in the current public safety bands for public safety service purposes must provide analog and digital interoperability such as the nationwide NPSPAC mutual aid channels at 800 MHz and the P25 Phase 1 interoperability channels at 700 MHz. Air interface interoperability (direct mode or network mode) is only achieved if the user device can operate with the appropriate modulation scheme, voice codecs, and over the air protocol as required on the system or network one wishes to interoperate with. Cassidian further comments that having the necessary modulation scheme, voice codecs, and over the air protocol is not enough to ensure interoperability. Proper programming of the user devices to ensure appropriate behavior when interoperating is also

required, along with the necessary Service Level Agreements (SLAs) between the agencies to ensure that QoS, priority levels, operational features, etc., are harmonized between the agencies.

Cassidian recommends that use of TETRA in the public safety pool can be accomplished if the appropriate interoperability and mutual aid modes, analog and digital, are embedded in the TETRA user devices.

### 3. Interoperability between TETRA and other system architectures is achievable (§III, ¶15)

Interoperability between TETRA and other system architectures is clearly achievable. Interoperability between different LMR radio systems can be achieved with open standard interfaces in the case of homogenous systems (i.e. TETRA ISI, P25 ISSI) and/or external interfaces using gateways between dissimilar systems (which may include or leverage homogenous interfaces such as TETRA ISI and P25 ISSI). The use of gateways is the default option when the deployed LMR systems are diverse and the systems are old or otherwise incapable of providing standard interfaces for homogenous interconnection. Today, there are in the market a wide range of gateway products to interconnect analog LMR, various digital LMR, Project 25, and IP voice telephony/PTT systems. Extending the concept to include TETRA simply means providing the TETRA interface from the Gateway to a TETRA system, using TETRA ISI or the various TETRA voice and data interfaces (typically control room/dispatch console interfaces) to provide the interconnection. Most TETRA systems also have a digital PCM/analog interface for group communications, in the same way as analog or conventional P25 systems.

The issue of terminal interoperability with TETRA is much the same as the issue with LMR/analog, other digital LMR, and P25 terminals. Depending on the use case (mobile, handheld, airborne, etc.) simultaneous support of several modulation schemes and radio channel

bandwidths is an issue of implementation and cost. A multifunction radio terminal with both TETRA and LMR/P25 analog can be implemented as use cases and market conditions require.

Roaming/migration between (homogenous) TETRA systems is defined in the TETRA standards, has been implemented in several networks, and has been demonstrated in international cross-border trials. Roaming between dissimilar systems (TETRA, analog LMR, other digital LMR, P25, etc.) assumes a radio terminal to have all necessary operating modes in the roaming user device. Cassidian notes that automated roaming requires secured authentication from the user home and possibly also from the roamed network (depends on trust policies) and requires a standardized interface between the home and visited systems that supports roaming subscriber control messages. Between dissimilar LMR systems, terminal roaming is achieved by attaching the same voice groups or common mutual aid groups in a multifunction radio terminal to each operating mode and can require manual intervention to select the appropriate talk group and operating mode. The gateway interface between the two systems provides the voice path intersystem connectivity.

Cassidian notes that use of gateways to interconnect dissimilar systems at the network level entail some loss of important features such as end-to-end voice encryption (if employed) . Basic features such as user or talk group ID and emergency alert may be translated via a gateway but other features such as radio unit monitoring, radio check, etc., may be not be depending on the sophistication of the gateway to fully decode all facets of the protocols being translated.

In summary interoperability between TETRA and other system architectures can be implemented via open standard interfaces and gateways as are currently implemented for existing LMR analog, other LMR digital, and P25 systems.

### 4. Interoperability with 700 MHz Narrowband and Broadband is achievable (§III, ¶15)

The Commission asks if interoperability can "be achieved with the 700 MHz narrowband and broadband systems that public safety is currently" deploying and if there are new specifications that have to be developed for these systems to support interoperability, noting one solution is the use of gateways and if these gateways are currently available.

Cassidian responds the current 700 MHz narrowband interoperability channels require the Project 25 Phase 1 air interface and thus use of the open standard P25 ISSI[8] facilitates interoperability between P25 systems and via gateway to other systems (i.e. different emissions, over the air protocols, and modulation schemes) as discussed previously. The P25 ISSI is an IETF SIP[9] and RTP[10] based protocol that fundamentally provides the ability to interconnect dissimilar IP based digital systems, using the call setup, in-call control, call tear-down and user end point service discovery capability of SIP (i.e. voice and video codecs) and low latency voice packet delivery using RTP. The TETRA ISI provides a standardized interface that can be implemented in currently available gateway platforms and thus allow TETRA to interoperate with P25 700 MHz interoperability channels, analog LMR (i.e. NPSPAC 800 MHz mutual aid channels), and other digital LMR). Additionally, certain general purpose interoperability platforms, utilizing guidelines such as the DHS OIC VoIP Roundtable Bridging System Interface (BSI) SIP profiles and best practices, can also provide inter-system interoperability. These platforms should meet the FCC's definition of a "gateway" and are available today from a variety of manufacturers.

[8] TIA 102.BACA-A, Project 25 Inter-RF Subsystem Interface Messages and Procedures for Voice and Mobility Management Services, January 2009.

[9] Internet Engineering Task Force, SIP: Session Initiation Protocol, RFC3261, IETF, June 2002, as applied in TIA 102.BACA-A.

[10] Internet Engineering Task Force, RTP: A Transport Protocol for Real Time Applications, RFC 3550, IETF, July 2003, as applied in TIA 102.BACA-A.

# II. CONCLUSION

Cassidian Communications, Inc., appreciates the opportunity to comment on the WT Docket 11-69 and ET Docket 09-234, Notice of Proposed Rulemaking and Order and hopes the Commission will take into consideration Cassidian's views on this proceeding.

Respectfully submitted,
CASSIDIAN COMMUNICATIONS, INC.

By: ___/s/_____

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June 27, 2011